Status Report for WI to TSG

Work Item Name: FDD Enhanced Uplink (All building blocks)

Building Block	Acronym	WG
FDD Enhanced Uplink - Stage 2	EDCH-Stage2	R2
FDD Enhanced Uplink - Physical Layer	EDCH-Phys	R1
FDD Enhanced Uplink - Layer 2 and 3 Protocol Aspects	EDCH-L23	R2
FDD Enhanced Uplink - UTRAN Iub/Iur Protocol Aspects	EDCH-IurIub	R3
FDD Enhanced Uplink - RF Radio Transmission/ Reception, System Performance Requirements and Conformance Testing	EDCH-RF	R4

SOURCE: Rapporteurs, 3GPP Support   **TSG:** RAN   **WG:** RAN1, RAN2, RAN3, RAN4

Rapporteurs:
WG1 : Karri Ranta-aho, Nokia   Karri.Ranta-aho@nokia.com
WG2 : Joakim Bergstrom, Ericsson   joakim.ko.bergstrom@ericsson.com
WG3 : Sašo Stojanovski, Nortel Networks   sasos@nortelnetworks.com
WG4 : Thomas Unshelm, Ericsson   Thomas.Unshelm@ericsson.com

Ref. to WI sheet: `ftp://ftp.3gpp.org/tsg_ran/TSG_RAN/Work_Item_sheets/`

WG1 Progress Report since the last TSG:

Since last TSG RAN plenary there were 2 regular TSG RAN WG1 meetings held:
TSG RAN WG1 #38bis in Seoul, Korea, 20th - 24th of September 2004 and
TSG RAN WG1 #39 in Shin-Yokohama, Japan, 15th - 19th of November 2004.

At RAN1#38bis 4 days were spent on enhanced uplink.
131 contributions related to FDD Enhanced Uplink were submitted and 65 treated. 7 text proposals were email approved after the meeting for inclusion to the TR25.808.

Between the two RAN1 meetings six email ad hoc groups were set up and tasked to produce draft CRs to TS25.21x specifications to the RAN1#39. Some 500 emails were sent during the 4 weeks between the meetings for these six email ad hocs enabling the CR editors to provide the first draft CRs of RAN1 specifications as well as an open item list per specification as an input to RAN1#39.

At RAN1#39 1 day was spent on enhanced uplink jointly with RAN2 and almost three day was spent in RAN1 only sessions. Some 130 contributions were submitted to the meeting, but the focus was more on going through and closing the identified open issues that were identified in the email ad hoc discussions and less on individual contributions. This approach proved to be highly effective, CR editors were able to provide updated versions of draft CRs during the meeting containing the new agreements for review. The final review of the corrections of the identified problems was left to be done over email.

RAN1 approved CRs on November 29th introducing FDD Enhanced Uplink to RAN1 specifications [1,2,3,4,5,6]

In general a big number of larger concepts and even bigger number smaller details were agreed in the period between RAN#25 nd RAN#26. Listing those would alone require a longish document.

WG2 Progress Report since the last TSG:

Since last TSG RAN plenary there were 2 regular TSG RAN WG2 meetings held:
TSG RAN WG2 #44 in Sophia Antipolis, France, 4th - 8th of October 2004 and
TSG RAN WG2 #45 in Shin-Yokohama, Japan, 15th - 19th of November 2004.

At RAN2#44 2.5 days were spent on enhanced uplink in a separate session.

At RAN2#45 1 day was spent on enhanced uplink jointly with RAN1 and 2 days in total was spent in RAN2 only sessions.

In addition there were a number of phone conferences held in between RAN2#44 and RAN2#45 and after RAN2#45 to progress both stage 2 and stage 3 for enhanced uplink.

RAN2 joint meetings with RAN1

There was conclusion reached on the scheduler.
Two UE behaviours for serving RLS:
- Relative Grant based
  - UE does Rate Requests
  - UE follows Absolute Grant and Relative Grants according to a concluded algorithm
- Non Relative Grant based
  - No UE Rate Requests
  - UE follows Absolute Grant
  - UE do autonomous ramp up

RRC signalling controls which of these behaviours the UE should follow.
A Relative Grant channel for Non-serving RLS is always allocated.
Relative Grant channels can be common or dedicated; the UE does not need to know which.

What is controlled with scheduling grants was concluded at the RAN1 and RAN2 joint discussions to be (E-DPDCH+DPDCH)/DPCCH power ratio. However, the issue was revisited after the WG meetings in the phone conferences on stage 3 and some companies preferred E-DPDCH/DPCCH power ratio instead. Therefore, TSG RAN WG2 presents several stage 2 CRs with this as the only difference. Also the alternative to leave this as FFS is brought to RAN. The decision on which scheduling domain to use is not foreseen to be controversial and it is left for RAN to decide on the way forward.

WG2

Detailed MAC architecture has been completed. Detailed models of both UE and UTRAN MAC entities with all functions related to enhanced uplink have been completed.

For H-ARQ, it was concluded by RAN2 that there is no need for a special pre-emption mechanism.

For the Rate Request it was concluded that:
- In case the UE has no scheduling grant, a Scheduling Request is sent to the Serving E-DCH RLS in a MAC-e PDU. The transmission is non-scheduled.
- In case the UE has a scheduling grant, a Scheduling Request is sent to the Serving E-DCH RLS along with the data in the MAC-e PDU.
- Details on when and how Scheduling requests are included in the MAC-e PDU remains to be concluded.
- Information to send from UE to Network
  - Buffer occupancy
  - Estimation of the available or needed power/rate

Also it was agreed that for both 2ms and 10ms TTI the E-DPCCH have 7 bits for E-TFC and 2 bits RSN. The use of 1 additional bit on the E-DPCCH will be concluded in RAN2 after RAN1 decisions.

QoS control principles and E-TFC selection was concluded. Also there was agreement on methods for support of GBR services on E-DCH.

The detailed MAC-e header structure and the PDU format was concluded:
- Structure with MAC-e header information first followed by a number of MAC-es PDUs
- MAC-es PDU contains TSN and MAC-es SDUs with a given size for one logical channel
- Re-ordering is done per logical channel
- N field have a fixed size of 6 bits
- TSN have a fixed size of 6 bits
- DDI field (6 bits) carried all the way to the SRNC
  - Gives Size, Logical channel and MAC-d flow mapping
  - Node-B knows DDI to MAC-d flow mapping
- C/T field not included in the MAC-es PDUs
- No F bit included

For MAC-es re-ordering there was in addition to TSN, agreement on Node-B tagging with CFN and sub-frame number.

Parameters that need to be signalled to the UE for enhanced uplink have been identified and introduced in RRC. UE actions and procedure text related to E-DCH IEs have been concluded.

After RAN2#45, phone conferences and email discussions were held to finalize Change Requests to stage 2 (TS 25.309) and protocol specifications (TS 25.321 and TS 25.331). Other specifications impacted by the introduction of enhanced uplink (TS 25.301 and TS 25.302) were finalized on email.

The CRs to TS 25.309 including new stage 2 agreements, and the CRs to TS 25.301, 25.302, 25.321 and 25.331 introducing enhanced uplink into RAN2 specifications, are presented here for approval to RAN2#26, December 2004.

WG3 Progress Report since the last TSG:

FDD Enhanced Uplink WI received about a half-day of meeting time in RAN3#44 (Sophia Antipolis) and about a full day of meeting time in RAN3#45 (Shin-Yokohama).

Following RAN3#44, document R3-041652 captures the latest version of the RAN3-internal TR (R3.015 v0.2.0).

In RAN3#45 substantial meeting time was spent discussing contributions on the following topics:
- Iub/Iur **measurement reporting** for support of RRM for FDD Enhanced Uplink;
- Iub/Iur **frame protocol** details for E-DCH (e.g. timing relationship between E-DCH FP frames over Iub/Iur and the TTI over radio, support for Open Loop Power Control, etc.);
- Mechanisms for Iub/Iur **TNL congestion control** (e.g. detection, notification, etc.);
- Proposed Stage 3 **draft CRs** for introduction of FDD Enhanced Uplink in RAN3 specifications.

A number of agreements were made in this meeting. They will be captured in the updated Stage 3 CRs, as well as in the next version of R3.015.

WG4 Progress Report since the last TSG:

10 contributions covering simulation assumptions and requirement structure for both DL and UL, first draft Node B receiver performance simulation results, mapping of cubic metric to additional PA headroom, on E-DCH TFC selection, and impact of UE power requirement on end-user perceived performance for Enhanced Uplink were presented at RAN4#33.

A small Ad Hoc session was held on Monday evening, and document (R4-040733) summarizes the conclusions in terms of agreements and open issues. It is agreed to create a dedicated email reflector for Enhanced Uplink work.

A conference call (chaired by Ericsson) to finalize the open points as much as possible is also agreed to speed the progress.

List of Completed elements (for complex work items):

WG1
- Physical channel strucutres
- Uplink code mapping
- Cannel processing
- HARQ functionality and derivation and mapping of the HARQ incremental redundancy versions
- Applicability of Tx diversity and phase references to E-channels

CRs to the following impacted RAN1 specifications are presented for approval to RAN#26, December 2004:
- TS 25.201
- TS 25.211
- TS 25.212
- TS 25.213
- TS 25.214
- TS 25.215

WG2

Stage 2 TS 25.309 was already approved at RAN#25, September 2004.

CRs to the following impacted RAN2 specifications are presented for approval to RAN#26, December 2004:

- TS 25.301
- TS 25.302
- TS 25.321
- TS 25.331

WG3
- Agreed CRs for inclusion of the FDD Enhanced Uplink "basics" in 25.401, 25.420, 25.423, 25.427, 25.430 and 25.433.

WG4
None

List of open issues:
WG1:

    Larger issues to be resolved:
- Channel timings (Defining the UE and the Node B processing times)
- UE capabilities

    Smaller issues to be resolved:
- Number of HARQ processes (configurable or fixed to a specific TBD value, affects the processing times)
- Compressed mode with 10 ms TTI
- Computation of the E-TFC power offsets and number of reference E-TFCs for the computation
- Fixed or configuragle puncturing limit
- Need for new UTRAN/UE measurements or modifications to the existing ones.
- Inclusion of Rate Request bit to E-DPCCH
- Possibility to reduce the transmission power of re-transmissions
- Possibility to do code hopping for E-HICH/E-RGCH
- Possibility to do slot-by-slot power scaling of E-DPDCH only in case the UE runs out of transmission power within a TTI.
- The exact contents of E-AGCH are not yet defined (number of bits, inclusion of time duration, etc.).
- Relationship of the repetition of E-AGCH/E-HICH/E-RGCH to TTI is still under discussion
- Beta factor definition for E-DPDCH in 25.213 is still under discussion

WG2
- Most important building blocks and mechanisms are stable and completed. Remaining issues are related to details mainly in MAC and RRC.

WG3
- The reported object for Iub/Iur measurements: is it UL interference or Rise over Thermal (RoT)
- Feasibility of measurements allowing to discriminate the UL interference (or RoT) due to E-DCH traffic from the total UL interference (or RoT)
- Measurements for support of GBR traffic
- Completion of the overall Iub/Iur congestion control framework, notably, the content of the congestion notification information
- Additional flexibility for packaging data into E-DCH FP frames

WG4
Work just started

Estimates of the level of completion (when possible):
Stage 2: 100%
Physical Layer: 85%
Layer 2 and 3 Protocol Aspects: 80%
UTRAN Iub/Iur Protocol Aspects:
RF Radio Transmission/ Reception: 20%

WI completion date review resulting from the discussion at the working group:
Stage 2: December 2004
Physical Layer: December 2004
Layer 2 and 3 Protocol Aspects: December 2004
UTRAN Iub/Iur Protocol Aspects: March 2005
RF Radio Transmission/ Reception: June 2005

References to WG's internal documentation and/or TRs:
[1] R1-041517   CR 25.201-019rev0
[2] R1-041512   CR 25.211-195rev1
[3] R1-041520   CR 25.212-196rev2
[4] R1-041516   CR 25.213-071rev2
[5] R1-041521   CR 25.214-361rev1
[6] R1-041514   CR 25.215-149rev1

R3-041652 R3.015 v0.2.0 FDD Enhanced Uplink: UTRAN Iub/Iur Protocol Aspects

R4-040588   FDD Enhanced UL Uplink simulation assumptions and requirements; Ericsson
R4-040508   FDD Enhanced UL Node B Receiver Performance Simulation Results; Ericsson
R4-040601   FDD Enhanced UL Downlink simulation assumptions and requirements; Ericsson
R4-040603   Impact of UE power requirement on end-user perceived performance for Enhanced Uplink;
Ericsson
R4-040615   E-DCH Performance Requirements; Nokia
R4-040639   Enhanced Uplink Performance Simulation Results; Motorola
R4-040645   Enhanced Uplink Simulation Assumptions; Motorola
R4-040659   FDD Enhanced Uplink, simulation requirements for performance evaluation; NEC
R4-040713   On E-DCH TFC selection; NEC
R4-040721   Mapping of cubic metric to additional PA headroom; Qualcomm
R4-040733   Enhanced Uplink Agreements and Open Points; Enhanced Uplink Offline Discussion Group